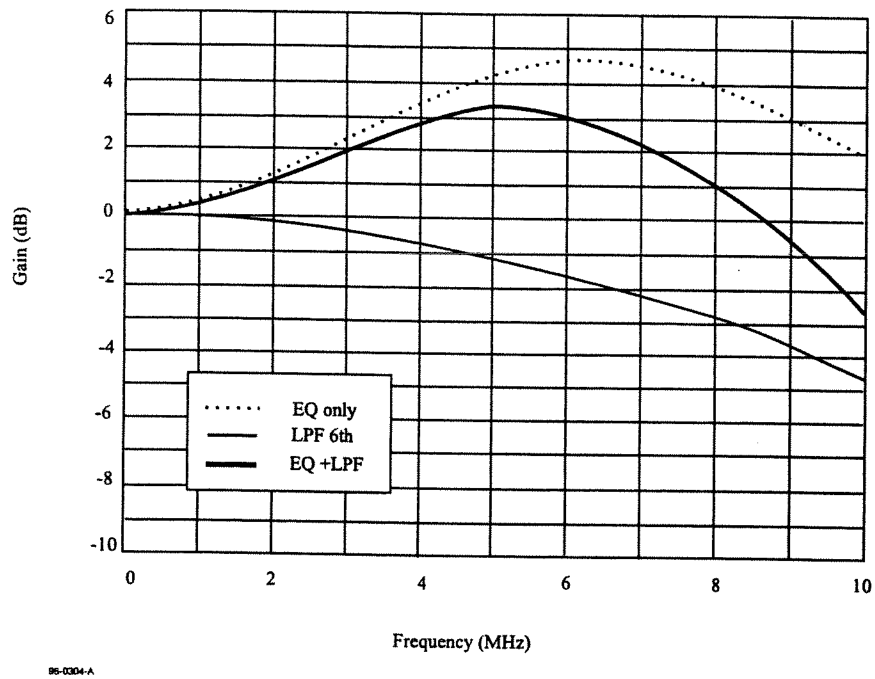

Figure F.3 - Frequency characteristics for the equalizer and the low-pass filter

F.5 Measurement

The jitter of all leading and trailing edges over one rotation shall be measured.

Under this measurement, the jitter shall be less than 8,0 % of the Channel bit clock period.

Annex G
(normative)

8-to-16 Modulation with RLL (2,10) requirements

Tables G.1 and G.2 list the 16-bit Code Words into which the 8-bit coded Data bytes have to be transformed. Figure G.1 shows schematically how the Code Words and the associated State specification are generated.

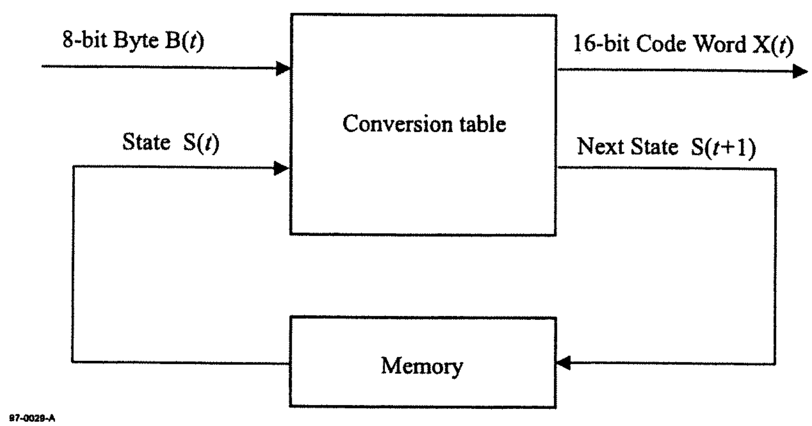

Figure G.1 - Code Words generation

In this figure :

$X(t) = H\{B(t), S(t)\}$
$S(t+1) = G\{B(t), S(t)\}$
H is the output function
G is the next-state function

$X_{15}(t)$ = msb and $X_0(t)$ = lsb

The Code Words leaving the States shall be chosen so that the concatenation of Code Words entering a State and those leaving that State satisfy the requirement that between two ONEs there shall be at least 2 and at most 10 ZEROs.

As additional requirements:

– Code Words leaving State 2 shall have both bit x15 and bit x3 set to ZERO, and
– in Code Words leaving State 3 bit x_{15} or bit x_3 or both shall be set to ONE.

This means that the Code Word sets of States 2 and 3 are disjoint.

Code Word X(*t*)	**Next State S(*t*+1)**	**Code Word X(*t*+1)**
Ends with 1 or no trailing ZERO	State 1	Starts with 2 or up to 9 leading ZEROs
Ends with 2 or up to 5 trailing ZEROs	State 2	Starts with 1 or up to 5 leading ZEROs, and $X_{15}(t+1), X_3(t+1) = 0,0$
Ends with 2 or up to 5 trailing ZEROs	State 3	Starts with none or up to 5 leading ZEROs, and $X_{15}(t+1), X_3(t+1) \neq 0,0$
Ends with 6 or up to 9 trailing ZEROs	State 4	Starts with 1 or no leading ZERO

Figure G.2 - Determination of States

Note that when decoding the recorded data, knowledge about the encoder is required to be able to reconstitute the original main Data.

$$B(t) = H^{-1}\{X(t), S(t)\}$$

Because of the involved error propagation, such state-dependent decoding is to be avoided. In the case of this 8-to-16 modulation, the conversion tables have been chosen in such a way that knowledge about the State is not required in most cases. As can be gathered from the tables, in some cases, two 8-bit bytes, for instance the 8-bit bytes 5 and 6 in States 1 and 2 in table G.1, generate the same 16-bit Code Words. The construction of the tables allows to solve this apparent ambiguity. Indeed, if two identical Code Words leave a State, one of them goes to State 2 and the other to State 3. Because the setting of bits X_{15} and X_3 is always different in these two States, any Code Word can be uniquely decoded by analysing the Code Word itself together with bits X_{15} and X_3 of the next Code Word :

$$B(t) = H^{-1}\{ X(t), X_{15}(t+1), X_3(t+1) \}$$

In the tables, the 8-bit bytes are identified by their decimal value.

Table G.1 - Main Conversion Table

8-bit byte	State 1 Code Word msb lsb	Next State	State 2 Code Word msb lsb	Next State	State 3 Code Word msb lsb	Next State	State 4 Code Word msb lsb	Next State
0	0010000000001001	1	0100000100100000	2	0010000000001001	1	0100000100100000	2
1	0010000000010010	1	0010000000010010	1	1000000100100000	3	1000000100100000	3
2	0010000100100000	2	0010000100100000	2	1000000000010010	1	1000000000010010	1
3	0010000001001000	2	0100010010000000	4	0010000001001000	2	0100010010000000	4
4	0010000010010000	2	0010000010010000	2	1000000100100000	2	1000000100100000	2
5	0010000000100100	2	0010000000100100	2	1001001000000000	4	1001001000000000	4
6	0010000000100100	3	0010000000100100	3	1000100100000000	4	1000100100000000	4
7	0010000001001000	3	0100000000010010	1	0010000001001000	3	0100000000010010	1
8	0010000010010000	3	0010000010010000	3	1000010010000000	4	1000010010000000	4
9	0010000100100000	3	0010000100100000	3	1001001000000001	1	1001001000000001	1
10	0010010010000000	4	0010010010000000	4	1000100100000001	1	1000100100000001	1
11	0010001001000000	4	0010001001000000	4	1000000010010000	3	1000000010010000	3
12	0010010010000001	1	0010010010000001	1	1000000010010000	2	1000000010010000	2
13	0010001001000001	1	0010001001000001	1	1000010010000001	1	1000010010000001	1
14	0010000001001001	1	0100000000100100	3	0010000001001001	1	0100000000100100	3
15	0010000100100001	1	0010000100100001	1	1000001001000001	1	1000001001000001	1
16	0010000010010001	1	0010000010010001	1	1000000100100001	1	1000000100100001	1
17	0010000000100010	1	0010000000100010	1	1000001001000000	4	1000001001000000	4
18	0001000000001001	1	0100000010010000	2	0001000000001001	1	0100000010010000	2
19	0010000000010001	1	0010000000010001	1	1001000100000000	4	1001000100000000	4
20	0001000000010010	1	0001000000010010	1	1000100010000000	4	1000100010000000	4
21	0000100000000010	1	0000100000000010	1	1000000010010001	1	1000000010010001	1
22	0000010000000001	1	0000010000000001	1	1000000001001001	1	1000000001001001	1
23	0010001000100000	2	0010001000100000	2	1000000001001000	2	1000000001001000	2
24	0010000100010000	2	0010000100010000	2	1000000001001000	3	1000000001001000	3
25	0010000010001000	2	0100000000100100	2	0010000010001000	2	0100000000100100	2
26	0010000001000100	2	0010000001000100	2	1000000000100010	1	1000000000100010	1
27	0001000100100000	2	0001000100100000	2	1000000000010001	1	1000000000010001	1
28	0010000000001000	2	0100000010010000	3	0010000000001000	2	0100000010010000	3
29	0001000010010000	2	0001000010010000	2	1001001000000010	1	1001001000000010	1
30	0001000001001000	2	0100000100100000	3	0001000001001000	2	0100000100100000	3
31	0001000000100100	2	0001000000100100	2	1001000100000001	1	1001000100000001	1
32	0001000000000100	2	0001000000000100	2	1000100100000010	1	1000100100000010	1
33	0001000000000100	3	0001000000000100	3	1000100010000001	1	1000100010000001	1
34	0001000000100100	3	0001000000100100	3	1000000000100100	2	1000000000100100	2
35	0001000001001000	3	0100001001000000	4	0001000001001000	3	0100001001000000	4
36	0001000010010000	3	0001000010010000	3	1000000000100100	3	1000000000100100	3
37	0001000100100000	3	0001000100100000	3	1000010001000000	4	1000010001000000	4
38	0010000000001000	3	0100100100000001	1	0010000000001000	3	0100100100000001	1
39	0010000001000100	3	0010000001000100	3	1001000010000000	4	1001000010000000	4
40	0010000010001000	3	0100010010000001	1	0010000010001000	3	0100010010000001	1
41	0010000100010000	3	0010000100010000	3	1000010010000010	1	1000010010000010	1
42	0010001000100000	3	0010001000100000	3	1000001000100000	2	1000001000100000	2
43	0010010001000000	4	0010010001000000	4	1000010001000001	1	1000010001000001	1
44	0001001001000000	4	0001001001000000	4	1000001000100000	3	1000001000100000	3
45	0000001000000001	1	0100010001000000	4	1000001001000010	1	0100010001000000	4

continued

Table G.1 - Main Conversion Table (continued)

8-bit byte	State 1 Code Word msb lsb	Next State	State 2 Code Word msb lsb	Next State	State 3 Code Word msb lsb	Next State	State 4 Code Word msb lsb	Next State
46	0010010010000010	1	0010010010000010	1	1000001000100001	1	1000001000100001	1
47	0010000010001001	1	0100001001000001	1	0010000010001001	1	0100001001000001	1
48	0010010001000001	1	0010010001000001	1	1000000100010000	2	1000000100010000	2
49	0010001001000010	1	0010001001000010	1	1000000010001000	2	1000000010001000	2
50	0010001000100001	1	0010001000100001	1	1000000100010000	3	1000000100010000	3
51	0001000001001001	1	0100000100100001	1	0001000001001001	1	0100000100100001	1
52	0010000100100010	1	0010000100100010	1	1000000100100010	1	1000000100100010	1
53	0010000100010001	1	0010000100010001	1	1000000100010001	1	1000000100010001	1
54	0010000010010010	1	0010000010010010	1	1000000010010010	1	1000000010010010	1
55	0010000001000010	1	0010000001000010	1	1000000010001001	1	1000000010001001	1
56	0010000000100001	1	0010000000100001	1	1000000001000010	1	1000000001000010	1
57	0000100000001001	1	0100000010010001	1	0000100000001001	1	0100000010010001	1
58	0001001001000001	1	0001001001000001	1	1000000000100001	1	1000000000100001	1
59	0001000100100001	1	0001000100100001	1	0100000001001001	1	0100000001001001	1
60	0001000010010001	1	0001000010010001	1	1001001000010010	1	1001001000010010	1
61	0001000000100010	1	0001000000100010	1	1001001000001001	1	1001001000001001	1
62	0001000000010001	1	0001000000010001	1	1001000100000010	1	1001000100000010	1
63	0000100000010010	1	0000100000010010	1	1000000001000100	2	1000000001000100	2
64	0000010000000010	1	0000010000000010	1	0100000001001000	2	0100000001001000	2
65	0010010000100000	2	0010010000100000	2	1000010000100000	2	1000010000100000	2
66	0010001000010000	2	0010001000010000	2	1000001000010000	2	1000001000010000	2
67	0010000100001000	2	0100000000100010	1	0010000100001000	2	0100000000100010	1
68	0010000010000100	2	0010000010000100	2	1000000100001000	2	1000000100001000	2
69	0010000000010000	2	0010000000010000	2	1000000010000100	2	1000000010000100	2
70	0001000010001000	2	0100001000100000	2	0001000010001000	2	0100001000100000	2
71	0001001000100000	2	0001001000100000	2	0100000010001000	2	0100000010001000	2
72	0001000000001000	2	0100000100010000	2	0001000000001000	2	0100000100010000	2
73	0001000100010000	2	0001000100010000	2	1000000001000100	3	1000000001000100	3
74	0001000001000100	2	0001000001000100	2	0100000001001000	3	0100000001001000	3
75	0000100100100000	2	0000100100100000	2	1000010000100000	3	1000010000100000	3
76	0000100010010000	2	0000100010010000	2	1000001000010000	3	1000001000010000	3
77	0000100001001000	2	0100000001000100	2	0000100001001000	2	0100000001000100	2
78	0000100000100100	2	0000100000100100	2	1000000100001000	3	1000000100001000	3
79	0000100000000100	2	0000100000000100	2	1000000010000100	3	1000000010000100	3
80	0000100000000100	3	0000100000000100	3	0100000010001000	3	0100000010001000	3
81	0000100000100100	3	0000100000100100	3	1000100001000000	4	1000100001000000	4
82	0000100001001000	3	0100000001000100	3	0000100001001000	3	0100000001000100	3
83	0000100010010000	3	0000100010010000	3	1000000010001000	3	1000000010001000	3
84	0000100100100000	3	0000100100100000	3	1001001001001000	2	1001001001001000	2
85	0001000000001000	3	0100000100010000	3	0001000000001000	3	0100000100010000	3
86	0001000001000100	3	0001000001000100	3	1001001000100100	2	1001001000100100	2
87	0001000010001000	3	0100001000100000	3	0001000010001000	3	0100001000100000	3
88	0001000100010000	3	0001000100010000	3	1001001001001000	3	1001001001001000	3
89	0001001000100000	3	0001001000100000	3	1001000010000001	1	1001000010000001	1
90	0010000000010000	3	0010000000010000	3	1000100100010010	1	1000100100010010	1
91	0010000010000100	3	0010000010000100	3	1000100100001001	1	1000100100001001	1
92	0010000100001000	3	0100000000010001	1	0010000100001000	3	0100000000010001	1
93	0010001000010000	3	0010001000010000	3	1000100010000010	1	1000100010000010	1
94	0010010000100000	3	0010010000100000	3	1000100001000001	1	1000100001000001	1

Table G.1 - Main Conversion Table (continued)

8-bit byte	State 1		State 2		State 3		State 4	
	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State
95	0000001000000010	1	0100100100000010	1	1000010010010010	1	0100100100000010	1
96	0000000100000001	1	0100100010000001	1	1000010010001001	1	0100100010000001	1
97	0010010010001001	1	0100010000100000	2	0010010010001001	1	0100010000100000	2
98	0010010010010010	1	0010010010010010	1	1001001000000100	2	1001001000000100	2
99	0010010001000010	1	0010010001000010	1	1001001000100100	3	1001001000100100	3
100	0010010000100001	1	0010010000100001	1	1000010001000010	1	1000010001000010	1
101	0010001001001001	1	0100010010000010	1	0010001001001001	1	0100010010000010	1
102	0010001000100010	1	0010001000100010	1	1000010000100001	1	1000010000100001	1
103	0010001000010001	1	0010001000010001	1	1000001001001001	1	1000001001001001	1
104	0010000100010010	1	0010000100010010	1	1000001000100010	1	1000001000100010	1
105	0010000010000010	1	0010000010000010	1	1000001000010001	1	1000001000010001	1
106	0010000100001001	1	0100001000010000	2	0010000100001001	1	0100001000010000	2
107	0010000001000001	1	0010000001000001	1	1000000100010010	1	1000000100010010	1
108	0001001001000010	1	0001001001000010	1	1000000100001001	1	1000000100001001	1
109	0001001000100001	1	0001001000100001	1	1000000010000010	1	1000000010000010	1
110	0001000100100010	1	0001000100100010	1	1000000001000001	1	1000000001000001	1
111	0001000100010001	1	0001000100010001	1	0100000010001001	1	0100000010001001	1
112	0001000010010010	1	0001000010010010	1	1001001001001001	1	1001001001001001	1
113	0001000001000010	1	0001000001000010	1	1001001000100010	1	1001001000100010	1
114	0001000010001001	1	0100010000100000	3	0001000010001001	1	0100010000100000	3
115	0001000000100001	1	0001000000100001	1	1001001000010001	1	1001001000010001	1
116	0000100100100001	1	0000100100100001	1	1001000100010010	1	1001000100010010	1
117	0000100010010001	1	0000100010010001	1	1001000100001001	1	1001000100001001	1
118	0000100001001001	1	0100010001000001	1	0000100001001001	1	0100010001000001	1
119	0000100000100010	1	0000100000100010	1	1000100100100100	2	1000100100100100	2
120	0000100000010001	1	0000100000010001	1	1000100100000100	2	1000100100000100	2
121	0000010000001001	1	0100001001000010	1	0000010000001001	1	0100001001000010	1
122	0000010000010010	1	0000010000010010	1	1000100000100000	2	1000100000100000	2
123	0010010010000100	2	0010010010000100	2	1000010010000100	2	1000010010000100	2
124	0010010000010000	2	0010010000010000	2	1000010000010000	2	1000010000010000	2
125	0010001000001000	2	0100001000100001	1	0010001000001000	2	0100001000100001	1
126	0010001001000100	2	0010001001000100	2	1000001001000100	2	1000001001000100	2
127	0001000100001000	2	0100000100100010	1	0001000100001000	2	0100000100100010	1
128	0010000100100100	2	0010000100100100	2	1000001000001000	2	1000001000001000	2
129	0000100010001000	2	0100000100010001	1	0000100010001000	2	0100000100010001	1
130	0010000100000100	2	0010000100000100	2	1000000100100100	2	1000000100100100	2
131	0010000000100000	2	0010000000100000	2	1001001000000100	3	1001001000000100	3
132	0001001000010000	2	0001001000010000	2	1000100100100100	3	1000100100100100	3
133	0000100000001000	2	0100000010010010	1	0000100000001000	2	0100000010010010	1
134	0001000010000100	2	0001000010000100	2	1000100000100000	3	1000100000100000	3
135	0001000000010000	2	0001000000010000	2	1000010010000100	3	1000010010000100	3
136	0000100100010000	2	0000100100010000	2	1000010000010000	3	1000010000010000	3
137	0000100001000100	2	0000100001000100	2	1000001001000100	3	1000001001000100	3
138	0000010001001000	2	0100000001000010	1	0000010001001000	2	0100000001000010	1
139	0000010010010000	2	0000010010010000	2	1000001000001000	3	1000001000001000	3
140	0000010000100100	2	0000010000100100	2	1001000010000010	1	1001000010000010	1
141	0000010000000100	2	0000010000000100	2	1000000100000100	2	1000000100000100	2
142	0000010000000100	3	0000010000000100	3	1000000100100100	3	1000000100100100	3
143	0000010000100100	3	0000010000100100	3	1000000100000100	3	1000000100000100	3

Table G.1 - Main Conversion Table (continued)

8-bit byte	State 1 Code Word msb lsb	State 1 Next State	State 2 Code Word msb lsb	State 2 Next State	State 3 Code Word msb lsb	State 3 Next State	State 4 Code Word msb lsb	State 4 Next State
144	0000010001001000	3	0100000010000100	2	0000010001001000	3	0100000010000100	2
145	0000010010010000	3	0000010010010000	3	1001000001000000	4	1001000001000000	4
146	0000100000001000	3	0100000000010000	2	0000100000001000	3	0100000000010000	2
147	0000100001000100	3	0000100001000100	3	1000000000100000	2	1000000000100000	2
148	0000100010001000	3	0100000010000100	3	0000100010001000	3	0100000010000100	3
149	0000100100010000	3	0000100100010000	3	1000000000100000	3	1000000000100000	3
150	0001000000010000	3	0001000000010000	3	0100000100001000	3	0100000100001000	3
151	0001000010000100	3	0001000010000100	3	1000000001000000	4	1000000001000000	4
152	0001000100001000	3	0100001000010000	3	0001000100001000	3	0100001000010000	3
153	0001001000010000	3	0001001000010000	3	1001000001000001	1	1001000001000001	1
154	0010000000100000	3	0010000000100000	3	0100000100001000	2	0100000100001000	2
155	0010000100000100	3	0010000100000100	3	1001000100100100	3	1001000100100100	3
156	0010000100100100	3	0010000100100100	3	1000100100100010	1	1000100100100010	1
157	0010001000001000	3	0100000000100001	1	0010001000001000	3	0100000000100001	1
158	0010001001000100	3	0010001001000100	3	1000100100000100	3	0100100100000000	4
159	0010010000010000	3	0010010000010000	3	1001001001000100	2	1001001001000100	2
160	0010010010000100	3	0010010010000100	3	1001001000001000	2	1001001000001000	2
161	0000001000010010	1	0100000000010000	3	1000100100010001	1	0100000000010000	3
162	0000001000001001	1	0100100100100100	2	1000100010010010	1	0100100100100100	2
163	0000000100000010	1	0100100100100100	3	1000100010001001	1	0100100100100100	3
164	0000000010000001	1	0100100100010010	1	1000100001000010	1	0100100100010010	1
165	0010010010010001	1	0010010010010001	1	1001000100100100	2	1001000100100100	2
166	0010010000100010	1	0010010000100010	1	1001000100000100	2	1001000100000100	2
167	0010010001001001	1	0100100100000100	2	0010010001001001	1	0100100100000100	2
168	0010010000010001	1	0010010000010001	1	1001001001000100	3	1001001001000100	3
169	0010001000010010	1	0010001000010010	1	1000100000100001	1	1000100000100001	1
170	0010000100000010	1	0010000100000010	1	1000010010010001	1	1000010010010001	1
171	0010001000001001	1	0100100000100000	3	0010001000001001	1	0100100000100000	3
172	0010000010000001	1	0010000010000001	1	1000010001001001	1	1000010001001001	1
173	0001001000100010	1	0001001000100010	1	1000010000100010	1	1000010000100010	1
174	0001001000010001	1	0001001000010001	1	1000010000010001	1	1000010000010001	1
175	0001000100010010	1	0001000100010010	1	1000001000010010	1	1000001000010010	1
176	0001000010000010	1	0001000010000010	1	1000001000001001	1	1000001000001001	1
177	0001001001001001	1	0100100010000010	1	0001001001001001	1	0100100010000010	1
178	0001000001000001	1	0001000001000001	1	1000000100000010	1	1000000100000010	1
179	0000100100100010	1	0000100100100010	1	1000000010000001	1	1000000010000001	1
180	0000100100010001	1	0000100100010001	1	0100100100001001	1	0100100100001001	1
181	0001000100001001	1	0100100000100000	2	0001000100001001	1	0100100000100000	2
182	0000100010010010	1	0000100010010010	1	0100010010001001	1	0100010010001001	1
183	0000100001000010	1	0000100001000010	1	0100001001001001	1	0100001001001001	1
184	0000100010001001	1	0100010010000100	3	0000100010001001	1	0100010010000100	3
185	0000100000100001	1	0000100000100001	1	1001000000100000	2	1001000000100000	2
186	0000010010010001	1	0000010010010001	1	1000100100001000	2	1000100100001000	2
187	0000010000100010	1	0000010000100010	1	1000100010000100	2	1000100010000100	2
188	0000010001001001	1	0100100001000001	1	0000010001001001	1	0100100001000001	1
189	0000010000010001	1	0000010000010001	1	1000100000010000	2	1000100000010000	2
190	0000001001001000	2	0100010010000100	2	1000010010001000	2	0100010010000100	2
191	0000001000100100	2	0100010000010000	2	1000010001000100	2	0100010000010000	2
192	0000001000000100	2	0100001001000100	2	1000010000001000	2	0100001001000100	2

Table G.1 - Main Conversion Table (continued)

8-bit byte	State 1		State 2		State 3		State 4	
	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State
193	0010010010001000	2	0100010000010000	3	0010010010001000	2	0100010000010000	3
194	0010010001000100	2	0010010001000100	2	1000001001001000	2	1000001001001000	2
195	0010010000001000	2	0100010010010010	1	0010010000001000	2	0100010010010010	1
196	0010001000100100	2	0010001000100100	2	1000001000100100	2	1000001000100100	2
197	0010001000000100	2	0010001000000100	2	1000001000000100	2	1000001000000100	2
198	0010001001001000	2	0100010001000010	1	0010001001001000	2	0100010001000010	1
199	0001001001000100	2	0001001001000100	2	0100001000001000	2	0100001000001000	2
200	0001000100100100	2	0001000100100100	2	1001000000100000	3	1001000000100000	3
201	0001000100000100	2	0001000100000100	2	1000100100001000	3	1000100100001000	3
202	0001001000001000	2	0100010000100001	1	0001001000001000	2	0100010000100001	1
203	0001000000100000	2	0001000000100000	2	1000100010000100	3	1000100010000100	3
204	0000100010000100	2	0000100010000100	2	1000010010001000	3	1000010010001000	3
205	0000100000010000	2	0000100000010000	2	1000010001000100	3	1000010001000100	3
206	0000100100001000	2	0100001000100010	1	0000100100001000	2	0100001000100010	1
207	0000010010001000	2	0100001000010001	1	0000010010001000	2	0100001000010001	1
208	0000010001000100	2	0000010001000100	2	1000001000100100	3	1000001000100100	3
209	0000010000001000	2	0100000100010010	1	0000010000001000	2	0100000100010010	1
210	0000001000000100	3	0100000010000010	1	1000010000001000	3	0100000010000010	1
211	0000001000100100	3	0100000100100100	2	1000001001001000	3	0100000100100100	2
212	0000001001001000	3	0100000100000100	2	1000001000000100	3	0100000100000100	2
213	0000010000001000	3	0100000001000001	1	0000010000001000	3	0100000001000001	1
214	0000010001000100	3	0000010001000100	3	0100001000001000	3	0100001000001000	3
215	0000010010001000	3	0100000000100000	2	0000010010001000	3	0100000000100000	2
216	0000100000010000	3	0000100000010000	3	1001001000010000	3	1001001000010000	3
217	0000100010000100	3	0000100010000100	3	1001000100000100	3	1001000100000100	3
218	0000100100001000	3	0100000100000100	3	0000100100001000	3	0100000100000100	3
219	0001000000100000	3	0001000000100000	3	0100000100001001	1	0100000100001001	1
220	0001000100000100	3	0001000100000100	3	1001001000010000	2	1001001000010000	2
221	0001000100100100	3	0001000100100100	3	1001000100001000	2	1001000100001000	2
222	0001001000001000	3	0100000100100100	3	0001001000001000	3	0100000100100100	3
223	0001001001000100	3	0001001001000100	3	1001001000001000	3	1001001000001000	3
224	0010001000000100	3	0010001000000100	3	1000100000010000	3	1000100000010000	3
225	0010001000100100	3	0010001000100100	3	1001001001000010	1	1001001001000010	1
226	0010001001001000	3	0100001001000100	3	0010001001001000	3	0100001001000100	3
227	0010010000001000	3	0100100100000100	3	0010010000001000	3	0100100100000100	3
228	0010010001000100	3	0010010001000100	3	1001000100001000	3	1001000100001000	3
229	0010010010001000	3	0100000000100000	3	0010010010001000	3	0100000000100000	3
230	0010000001000000	4	0010000001000000	4	1001001000100001	1	1001001000100001	1
231	0000001001001001	1	0100100100100010	1	1001000100100010	1	0100100100100010	1
232	0000001000100010	1	0100100010000100	2	1001000100010001	1	0100100010000100	2
233	0000001000010001	1	0100100000010000	2	1001000010010010	1	0100100000010000	2
234	0000000100010010	1	0100000001000000	4	1001000010001001	1	0100000001000000	4
235	0000000100001001	1	0100100100010001	1	1001000001000010	1	0100100100010001	1
236	0000000010000010	1	0100100010010010	1	1001000000100001	1	0100100010010010	1
237	0000000001000001	1	0100100001000010	1	1000100100100001	1	0100100001000010	1
238	0010010000010010	1	0010010000010010	1	1000100010010001	1	1000100010010001	1
239	0010001000000010	1	0010001000000010	1	1001000010000100	3	1001000010000100	3
240	0010010000001001	1	0100100010000100	3	0010010000001001	1	0100100010000100	3
241	0010000100000001	1	0010000100000001	1	1001000010000100	2	1001000010000100	2

Table G.1 - Main Conversion Table (concluded)

8-bit byte	State 1		State 2		State 3		State 4	
	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State
242	0001001000010010	1	0001001000010010	1	1000000010000000	4	1000000010000000	4
243	0001000100000010	1	0001000100000010	1	1000100001001001	1	1000100001001001	1
244	0001001000001001	1	0100100000100001	1	0001001000001001	1	0100100000100001	1
245	0001000010000001	1	0001000010000001	1	1000100000100010	1	1000100000100010	1
246	0000100100010010	1	0000100100010010	1	1000100000010001	1	1000100000010001	1
247	0000100010000010	1	0000100010000010	1	1000010000010010	1	1000010000010010	1
248	0000100100001001	1	0100010010010001	1	0000100100001001	1	0100010010010001	1
249	0000100001000001	1	0000100001000001	1	1000010000001001	1	1000010000001001	1
250	0000010010010010	1	0000010010010010	1	1000001000000010	1	1000001000000010	1
251	0000010001000010	1	0000010001000010	1	1000000100000001	1	1000000100000001	1
252	0000010010001001	1	0100010000100010	1	0000010010001001	1	0100010000100010	1
253	0000010000100001	1	0000010000100001	1	0100100010001001	1	0100100010001001	1
254	0000001001000100	2	0100010000010001	1	1001000000010000	2	0100010000010001	1
255	0000001000001000	2	0100001000010010	1	1000100100010000	2	0100001000010010	1

Table G.2 - Substitution table (continued)

8-bit byte	State 1 Code Word msb lsb	State 1 Next State	State 2 Code Word msb lsb	State 2 Next State	State 3 Code Word msb lsb	State 3 Next State	State 4 Code Word msb lsb	State 4 Next State
0	0000010010000000	4	0000010010000000	4	0100100001001000	2	0100100001001000	2
1	0000100100000000	4	0000100100000000	4	0100100001001000	3	0100100001001000	3
2	0001001000000000	4	0001001000000000	4	0100100000001001	1	0100100000001001	1
3	0000001001000000	4	0100010000000001	1	1000001000000000	4	0100010000000001	1
4	0000000100100000	3	0100100000000010	1	1001000000000100	3	0100100000000010	1
5	0000000010010000	3	0100001000000000	4	1001000000100100	3	0100001000000000	4
6	0000000001001000	3	0100100000000100	2	1001000001001000	3	0100100000000100	2
7	0000000001001000	2	0100000100000000	4	1001000000000100	2	0100000100000000	4
8	0000000010010000	2	0100100010010000	3	1001000000100100	2	0100100010010000	3
9	0000000100100000	2	0100100000100100	2	1001000001001000	2	0100100000100100	2
10	0000010001000000	4	0000010001000000	4	1001001001000000	4	1001001001000000	4
11	0000100010000000	4	0000100010000000	4	1000100001001000	3	1000100001001000	3
12	0001000100000000	4	0001000100000000	4	0100010001001000	3	0100010001001000	3
13	0010001000000000	4	0010001000000000	4	1000100000000100	3	1000100000000100	3
14	0000001000100000	3	0100100000000100	3	1001000010010000	3	0100100000000100	3
15	0000000100010000	3	0100100010010000	2	1001000100100000	3	0100100010010000	2
16	0000000010001000	3	0100001000000001	1	0100100000001000	3	0100001000000001	1
17	0000000001000100	3	0100010000000010	1	0100100010001000	3	0100010000000010	1
18	0000000001000100	2	0100100000100100	3	1001000010010000	2	0100100000100100	3
19	0000000010001000	2	0100100100100000	3	1001000100100000	2	0100100100100000	3
20	0000000100010000	2	0100100100100000	2	0100010001001000	2	0100100100100000	2
21	0000001000100000	2	0100100000010010	1	0100100000001000	2	0100100000010010	1
22	0000010010000001	1	0000010010000001	1	1000100000100100	3	1000100000100100	3
23	0000100100000001	1	0000100100000001	1	1000100010010000	3	1000100010010000	3
24	0001001000000001	1	0001001000000001	1	0100100010001000	2	0100100010001000	2
25	0010010000000001	1	0010010000000001	1	1000100000000100	2	1000100000000100	2
26	0000000001001001	1	0100010000000100	3	1000010000000001	1	0100010000000100	3
27	0000000010010001	1	0100000100000001	1	1000100000000010	1	0100000100000001	1
28	0000000100100001	1	0100010000000100	2	1001000000001001	1	0100010000000100	2
29	0000001001000001	1	0100001000000010	1	1001000000010010	1	0100001000000010	1
30	0000100001000000	4	0000100001000000	4	1000100000100100	2	1000100000100100	2
31	0001000010000000	4	0001000010000000	4	1000100001001000	2	1000100001001000	2
32	0010000100000000	4	0010000100000000	4	0100010000001001	1	0100010000001001	1
33	0000010000100000	3	0000010000100000	3	0100100001001001	1	0100100001001001	1
34	0000001000010000	3	0100010000010010	1	1000100100100000	3	0100010000010010	1
35	0000000100001000	3	0100100000010001	1	1001000000001000	3	0100100000010001	1
36	0000000010000100	3	0100000010000000	4	1001000001000100	3	0100000010000000	4
37	0000010000100000	2	0000010000100000	2	1000001000000001	1	1000001000000001	1
38	0000000010000100	2	0100010000100100	3	1000100010010000	2	0100010000100100	3
39	0000000100001000	2	0100010000100100	2	1000100100100000	2	0100010000100100	2
40	0000001000010000	2	0100100000100010	1	1001000000001000	2	0100100000100010	1
41	0000010001000001	1	0000010001000001	1	1000010000000010	1	1000010000000010	1
42	0000010010000010	1	0000010010000010	1	1000000100000000	4	1000000100000000	4
43	0000100010000001	1	0000100010000001	1	1001000001000100	2	1001000001000100	2
44	0000100100000010	1	0000100100000010	1	1000100000001001	1	1000100000001001	1
45	0001000100000001	1	0001000100000001	1	1001000010001000	3	1001000010001000	3
46	0001001000000010	1	0001001000000010	1	1001000100010000	3	1001000100010000	3

Table G.2 - Substitution table (concluded)

8-bit byte	State 1		State 2		State 3		State 4	
	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State
47	0010001000000001	1	0010001000000001	1	1000100000010010	1	1000100000010010	1
48	0010010000000010	1	0010010000000010	1	0100010000001000	3	0100010000001000	3
49	0000000001000010	1	0100100010010001	1	1001000000010001	1	0100100010010001	1
50	0000000010001001	1	0100100001000100	3	1001000000100010	1	0100100001000100	3
51	0000000010010010	1	0100010010010000	3	1001000001001001	1	0100010010010000	3
52	0000000100010001	1	0100010010010000	2	1001000010010001	1	0100010010010000	2
53	0000000100100010	1	0100100001000100	2	1001000100100001	1	0100100001000100	2
54	0000001000100001	1	0100100100100001	1	1001001001000001	1	0100100100100001	1
55	0000001001000010	1	0100100100010000	3	0100001000001001	1	0100100100010000	3
56	0001000001000000	4	0001000001000000	4	1001001000100000	3	1001001000100000	3
57	0010000010000000	4	0010000010000000	4	1001000010001000	2	1001000010001000	2
58	0010010010010000	3	0010010010010000	3	1001000100010000	2	1001000100010000	2
59	0010010001001000	3	0100100100010000	2	0010010001001000	3	0100100100010000	2
60	0010010000100100	3	0010010000100100	3	1001001000100000	2	1001001000100000	2
61	0010010000000100	3	0010010000000100	3	0100001001001000	2	0100001001001000	2
62	0001001001001000	3	0100000010000001	1	0001001001001000	3	0100000010000001	1
63	0001001000100100	3	0001001000100100	3	0100001001001000	3	0100001001001000	3
64	0001001000000100	3	0001001000000100	3	0100010010001000	3	0100010010001000	3
65	0000100100100100	3	0000100100100100	3	0100100100001000	3	0100100100001000	3
66	0000100100000100	3	0000100100000100	3	1000010000000100	3	1000010000000100	3
67	0000100000100000	3	0000100000100000	3	1000010000100100	3	1000010000100100	3
68	0000010010000100	3	0000010010000100	3	1000010001001000	3	1000010001001000	3
69	0000010000010000	3	0000010000010000	3	1000010010010000	3	1000010010010000	3
70	0000001001000100	3	0100001000000100	2	1000100000001000	3	0100001000000100	2
71	0000001000001000	3	0100100000010000	3	1000100010001000	3	0100100000010000	3
72	0000000100100100	3	0100010001000100	3	1000100100010000	3	0100010001000100	3
73	0000000100000100	3	0100001000100100	3	1001000000010000	3	0100001000100100	3
74	0000010000010000	2	0000010000010000	2	1000100001000100	3	1000100001000100	3
75	0001001001001000	2	0100001000000100	3	0001001001001000	2	0100001000000100	3
76	0000010010000100	2	0000010010000100	2	0100010000001000	2	0100010000001000	2
77	0000100000100000	2	0000100000100000	2	0100010010001000	2	0100010010001000	2
78	0010010001001000	2	0100000100000010	1	0010010001001000	2	0100000100000010	1
79	0000100100000100	2	0000100100000100	2	0100100100001000	2	0100100100001000	2
80	0000100100100100	2	0000100100100100	2	1000010000000100	2	1000010000000100	2
81	0001001000000100	2	0001001000000100	2	1000010000100100	2	1000010000100100	2
82	0001001000100100	2	0001001000100100	2	1000010001001000	2	1000010001001000	2
83	0010010000000100	2	0010010000000100	2	1000010010010000	2	1000010010010000	2
84	0010010000100100	2	0010010000100100	2	1000100000001000	2	1000100000001000	2
85	0010010010010000	2	0010010010010000	2	0100010001001001	1	0100010001001001	1
86	0000000100000100	2	0100001000100100	2	1000100001000100	2	0100001000100100	2
87	0000000100100100	2	0100010001000100	2	1000100010001000	2	0100010001000100	2

Annex H
(normative)

Burst Cutting Area (BCA)

The BCA is an option available only for Type A and Type C disks, where the application is not a typical video application. If implemented, it shall meet the requirements of this annex.

The purpose of the code recorded in the BCA is to provide a link between the content of a disk and the software to be used with that disk. Therefore, only the structure of this code is specified in this annex and not the content of the data bytes. The latter is to be supplied by the content provider of the disk. The BCA code can be the same for a series of disks or unique for each disk, for instance if it specifies a serial number. The BCA code is recorded after the end of the disk manufacturing process.

The BCA code shall be readable by means of the PUH specified in 9.1. It can be written on the recorded layer of a Type A disk and on Layer 1 of a Type C disk by means of a high-power system such as a YAG laser, a method called "burst cutting". The BCA code can also be obtained by means of a replication process using embossed pits if the read-out signals satisfy the requirements specified below.

H.1 Location of the BCA

The BCA is an annular area which shall extend between diameters d_{11} and d_{12} shown in figure 7

$$d_{11} = 44{,}6 \text{ mm} \begin{array}{l} +0{,}0 \text{ mm} \\ -0{,}8 \text{ mm} \end{array}$$

$$d_{12} = 47{,}0 \text{ mm} \begin{array}{l} +0{,}1 \text{ mm} \\ -0{,}1 \text{ mm} \end{array}$$

According to 10.6 the Lead-in Zone can start within the area defined by d_6 = 44,0 mm max and d_7 = 45,2 mm max. If the BCA is implemented, d_7 shall be restricted to 44,5 mm max.

The BCA code shall be written with a series of low reflectance stripes arranged in circumferential direction and extending radially between d_{11} and d_{12} ,see figure H.1.

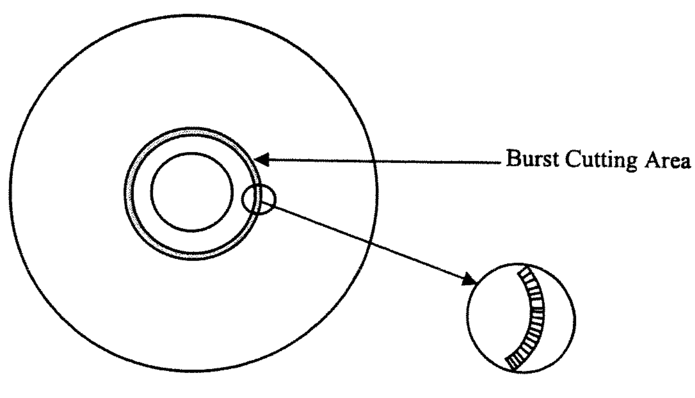

Figure H.1 - Burst Cutting Area

H.2 Modulation method

Data intended for the BCA code shall be encoded by phase encoding according to which a ZERO bit is represented by two Channel bits set to ONE ZERO and a ONE bit by two Channel bits set to ZERO ONE. The sequence of Channel bits shall be modulated according to the Return-to-Zero modulation method (see figure H.4). The low reflectance stripes shall be formed corresponding to pulses after the RZ modulation. They shall not exceed half the width of a Channel bit.

H.3 BCA code structure

The BCA code shall consist of a Preamble, a Data field and a Postamble.

Resync 1 byte	BCA data 4 bytes					
SB_{BCA}	PR_0	PR_1	PR_2	PR_3	1 row	BCA Preamble
RS_{BCA1}	I_0	I_1	I_2	I_3	4*n* rows	Information data
RS_{BCA1}	I_4	I_5	I_6	I_7		
RS_{BCA1}	I_8	I_9	I_{10}	I_{11}		
RS_{BCA1}	I_{12}	I_{13}	I_{14}	I_{15}		
RS_{BCA2}	I_{16}	I_{17}	I_{18}	I_{19}		
RS_{BCA2}	I_{20}	I_{21}	I_{22}	I_{23}		
RS_{BCA2}	:	:	:	:		
RB_{BCA2}	:	:	:	:		
RS_{BCAn-1}	:	:	:	:		
RS_{BCAn}	:	:	:	:		
RS_{BCAn}	I_{16n-12}	I_{16n-11}	I_{16n-10}	I_{16n-9}		
RS_{BCAn}	I_{16n-8}	I_{16n-7}	I_{16n-6}	I_{16n-5}		
RS_{BCAn}	D_0	D1	D_2	D_3	1 row	EDC_{BCA}
RS_{BCA13}	$C_{0,0}$	$C_{1,0}$	$C_{2,0}$	$C_{3,0}$	4 rows	ECC_{BCA}
RS_{BCA13}	$C_{0,1}$	$C_{1,1}$	$C_{2,1}$	$C_{3,1}$		
RS_{BCA13}	$C_{0,2}$	$C_{1,2}$	$C_{2,2}$	$C_{3,2}$		
RS_{BCA13}	$C_{0,3}$	$C_{1,3}$	$C_{2,3}$	$C_{3,3}$		
RS_{BCA14}	PO_0	PO_1	PO_2	PO_3	1 row	BCA Postamble
RS_{BCA15}						

97-0031-A

Figure H.2 - BCA code structure

The BCA Preamble shall consist of 4 bytes PR_0 to PR_3 set to (00) preceded by a BCA Sync byte identified as SB_{BCA}.

The Data field of the BCA shall consists of

- $(16 \times n)$-4 information bytes I_0, I_1 ....I_{16n-5}
- 4 bytes D_0, D_1, D_2 and D_3 of an error detection code EDC_{BCA}
- 16 bytes $C_{i,j}$ of an error correction code ECC_{BCA} recorded in the order $C_{0,0}$ to $C_{3,0}$; $C_{0,1}$ to $C_{3,1}$; $C_{0,2}$ to $C_{3,2}$ and $C_{0,3}$ to $C_{3,3}$

- where n is an integer such that $1 \leq n \leq 12$
- a Resync byte RS_{BCAi} shall be inserted before each 4-byte row of I_i bytes, changing every 4th row (see figure H.3)

The BCA Postamble shall consist of 4 bytes PO_0 to PO_3 set to (55) and preceded by Resync byte RS_{BCA14} and followed by Resync byte RS_{BCA15}.

H.4 Error Detection Code EDC_{BCA}

The 4 bytes D_0 to D_3 shall follow the information bytes I_i. Polynomials $EDC_{BCA}(x)$ and $I_{BCA}(x)$ shall be as follows.

$$EDC_{BCA}(x) = \sum_{i=0}^{31} b_i\, x^i$$

$$I_{BCA}(x) = \sum_{i=32}^{128n-1} b_i\, x^i$$

where i is the bit number starting with 0 and counted from the lsb of the last byte of EDC_{BCA} to the msb of the first byte of information data. The value of the i-th bit is represented by b_i. The polynomial $EDC_{BCA}(x)$ shall be calculated as follows

$$EDC_{BCA}(x) = I_{BCA}(x) \bmod G(x)$$

where $G(x) = x^{32} + x^{31} + x^4 + 1$

H.5 BCA Error Correction Code ECC_{BCA}

A Reed-Solomon ECC code with a 4-way interleave shall be applied to the information data and the EDC_{BCA} Polynomials $R_{BCAj}(x)$ and $I_{BCAj}(x)$ shall be as follows.

$$R_{BCAj}(x) = \sum_{i=0}^{3} C_{j,i}\, x^{3-i}$$

$$I_{BCAj}(x) = \sum_{i=0}^{4n-2} I_{(j+4i)}\, x^{51-i} + D_j\, x^{52-4n}$$

Where I_m represents the m-th information data byte and D_k represents the k-th EDC_{BCA} byte.

The polynomial $R_{BCAj}(x)$ shall be calculated as follows:

$$R_{BCAj}(x) = I_{BCAj}(x) \bmod G_{pBCA}(x)$$

$$G_{pBCA}(x) = \prod_{k=0}^{3} (x + \alpha^k)$$

where α is the primitive root of the polynomial $G_p(x) = x^8 + x^4 + x^3 + x^2 + 1$

H.6 Bit pattern of the SB_{BCA} byte and of the RS_{BCA} bytes

The BCA Sync byte SB_{BCA} and the Resync bytes RS_{BCAi} shall have the patterns shown in figure H.3

1 byte

Sync byte and Resync bytes	Bit patterns											
	Fixed pattern								Sync code			
	8 Channel bits								4 Data bits			
	Ch15	Ch14	Ch13	Ch12	Ch11	Ch10	Ch9	Ch8	b3	b2	b1	b0
SB_{BCA}	0	1	0	0	0	1	1	0	0	0	0	0
RS_{BCA1}	0	1	0	0	0	1	1	0	0	0	0	1
RS_{BCA2}	0	1	0	0	0	1	1	0	0	0	1	0
RS_{BCA3}	0	1	0	0	0	1	1	0	0	0	1	1
RS_{BCA4}	0	1	0	0	0	1	1	0	0	1	0	0
RS_{BCA5}	0	1	0	0	0	1	1	0	0	1	0	1
RS_{BCA6}	0	1	0	0	0	1	1	0	0	1	1	0
RS_{BCA7}	0	1	0	0	0	1	1	0	0	1	1	1
RS_{BCA8}	0	1	0	0	0	1	1	0	1	0	0	0
RS_{BCA9}	0	1	0	0	0	1	1	0	1	0	0	1
RS_{BCA10}	0	1	0	0	0	1	1	0	1	0	1	0
RS_{BCA11}	0	1	0	0	0	1	1	0	1	0	1	1
RS_{BCA12}	0	1	0	0	0	1	1	0	1	1	0	0
RS_{BCA13}	0	1	0	0	0	1	1	0	1	1	0	1
RS_{BCA14}	0	1	0	0	0	1	1	0	1	1	1	0
RS_{BCA15}	0	1	0	0	0	1	1	0	1	1	1	1
	Recorded in RZ modulation								Recorded in PE-.RZ modulation			

97-0032-A

Figure H.3 - Bit patterns of the SB_{BCA} byte and the RS_{BCA} bytes

H.7 BCA Signal specification

The read-out signal from the BCA shall meet the following requirements (figure H.4) .

- The amplitude level I_s which is the signal corresponding to a low-reflectance stripe shall not exceed I_{14L} or I_{14H} / 5.
- The Channel bit length of a BCA Channel bit, expressed in microseconds, shall be 8,89 µs at a rotational speed of 1 440 rpm (24 Hz).
- An edge position of the BCA signal shall be the position at which the BCA signal crosses the mean level between I_s and I_{14H}
- The length of pulses corresponding to the low-reflectance stripe shall be 3,00 µs ± 1,50 µs.
- The deviation of the time interval between successive leading edges shall not exceed 2,00 µs.

– The deviation of the time interval between the centres of successive pulses shall not exceed 1,50 µs. The centre of a pulse shall be the middle point between the leading edge and the trailing edge.

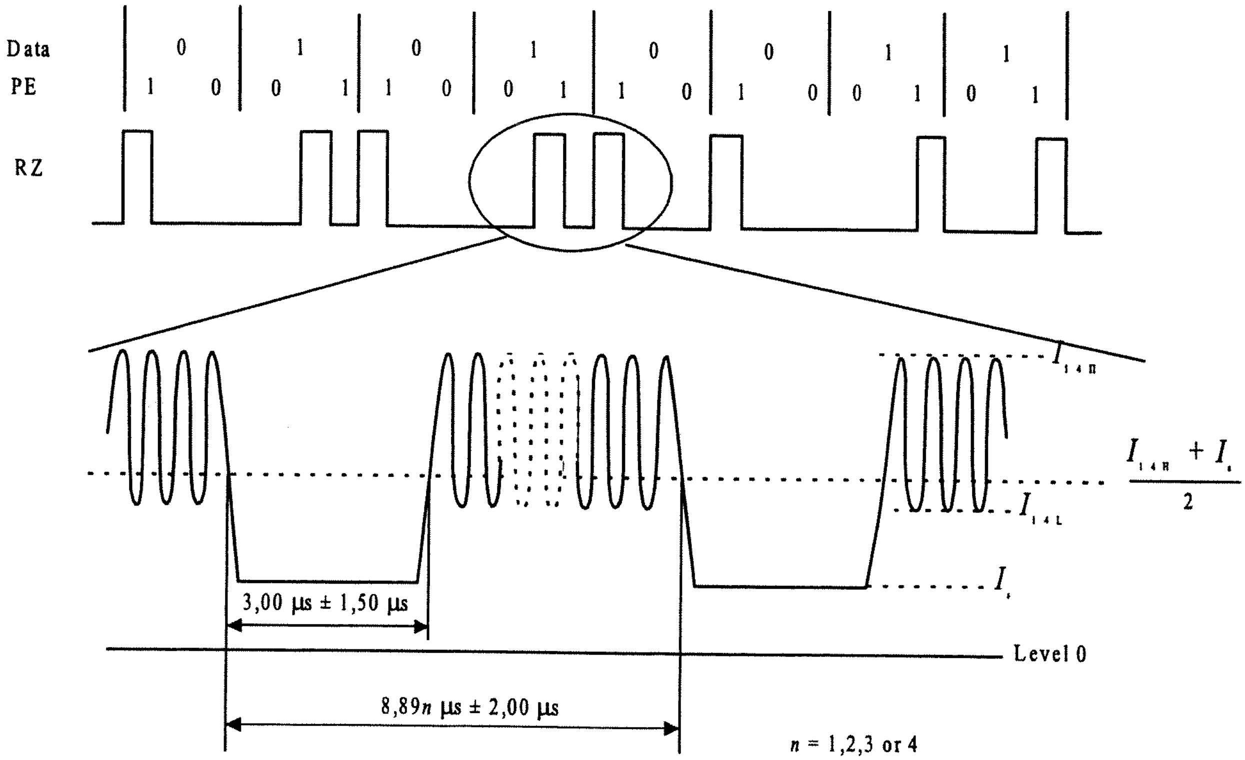

Figure H.4 - Read-out signal from the BCA

Annex J

(normative)

Source Identification Code (SID)

J.1 General

The requirements of this annex apply only to DVD-Read-Only disks using the DVD Audio Format.

The Source Identification Code (SID) shall be recorded on the inner side of the disk. It shall consist of visible characters such as the Registered Mark (™), a registered number of a laser beam recorder or a registered number of the mould by means of which the disk has been produced.

The SID Code shall consist of two elements : The Mastering Code and the Mould Code. The Mastering Code shall be generated by using the Laser Beam Recorder (LBR), thus it exist on the stamper. The Mould Code shall be etched on a mould, preferably on the mirror block. When a substrate is replicated, the Mastering Code shall be recorded on the side of the substrate on which the embossed data pits are recorded, and the Mould Code shall be recorded on the other side of the substrate. This annex specifies the area for the mandatory SID Code as well as an additional area in which other characters may be recorded, for instance the name of the manufacturer of the disk.

J.2 Requirement for implementation

The requirements of this annex apply only to DVD - Read-Only disks using the DVD Audio Format. The implementation of this annex is optional. If implemented all requirements of this annex are mandatory.

J.3 Recommendation

It is recommended to record the SID Code also on DVD-Read-Only disks other than those used in audio applications.

J.4 Mastering Code

J.4.1 Location

The Mastering Code shall be recorded within a zone delimited by a maximum radius of 22,5 mm. It shall be in an area where the reflecting layer exists. If the BCA option (See annex H) is implemented, the position of the Mastering Code shall be shifted toward the centre of the disk so that it does not overlap with the BCA.

J.4.2 Legibility

The height of the Mastering Code shall be 0,5 mm min. It shall be legible without magnification. It shall be readable from right to left when seen from the entrance surface of the disk. The position of the stack ring shall be chosen so as not to be over the Mastering Code.

J.4.3 Structure and space allocation

The area in which the Mastering Code is recorded shall be divided into two parts (Figure J.1).

In the first one either the characters of the International Federation of Photographic Industry (IFPI) in capital letter or the logo of IFPI shall be recorded.

In the second part of this area the LBR identification shall be recorded as a 4-character alpha-numeric identifier.

The area in which the Mastering Code shall be recorded shall consist of an arc of 30° max. The Mastering Code shall be clearly separated from other characters.

A further arc of 30° shall be reserved for future use.

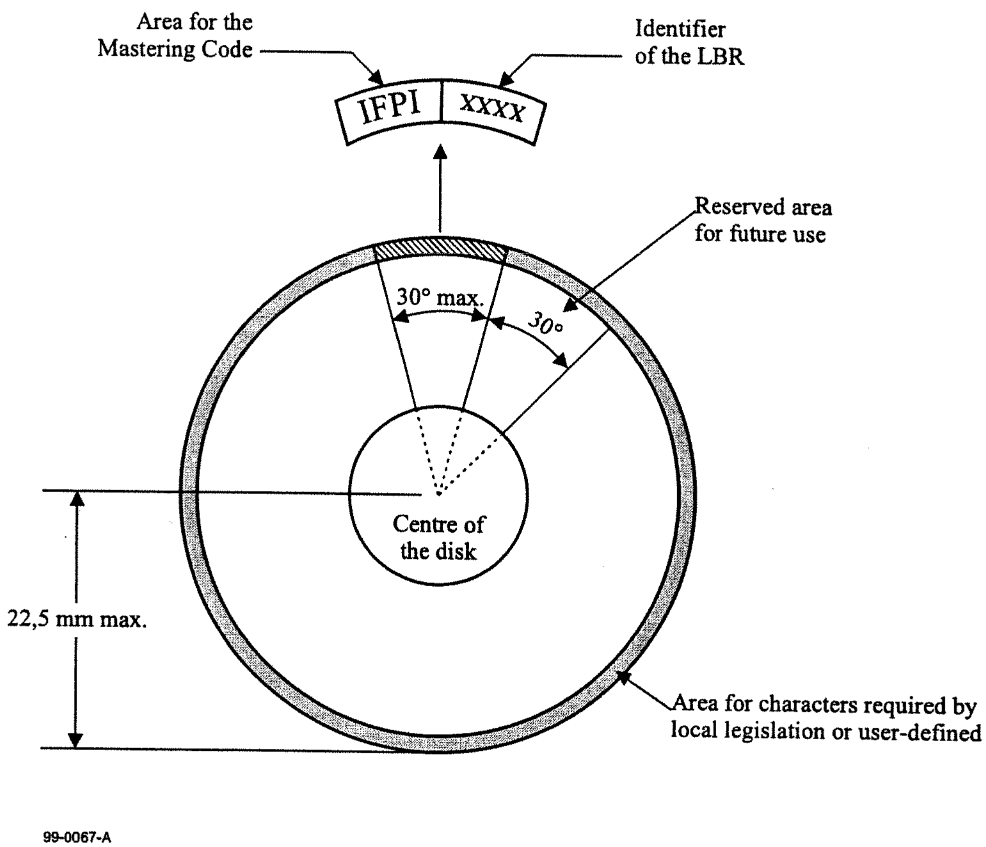

Figure J.1 - Mastering Code space allocation

J.4.4 Relaxation of requirements

In a number of situations, the requirements for the Mastering Code may be relaxed.

a) Single layer single-sided disk

If the dummy substrate side of the disk is made from a scrap program disk, it shall bear the Mastering Code even if it does not contain the reflective layer.

b) Dual layer single-sided disk

The Mastering Code shall be recorded in both Layer 0 and Layer 1. At least the Mastering Code of one of the layers shall be legible.

c) Single layer doubled-sided disk

The Mastering Code shall be recorded on both sides of the disk. However, its readability may be diminished due to restrictions in the printed area.

J.5 Mould Code

J.5.1 Location

The Mould Code shall be recorded within a zone limited by a maximum radius of 22,5 mm. If BCA option (See annex H) is implemented, the position of the Mould Code shall be shifted toward the centre of the disk so that it does not overlap with the BCA.

The Mould Code shall not be recorded in the Clamping Zone. It shall not be over the Mastering Code or user-defined characters such as the name of the manufacturer. The Mould Code shall be placed in a portion of the mould that is not easily exchanged.

J.5.2 Legibility

The height of the Mould Code shall be 0,5 mm min. It shall be legible without magnification. It shall be readable from right to left when seen from the entrance surface of the disk. Its layout shall be either radial or linear. It shall be readable from right to left when seen from the entrance surface of the disk.

J.5.3 Structure and space allocation

The area in which the Mould Code is recorded shall be divided into two parts (Figure J.1).

In the first one either the characters of the International Federation of Photographic Industry (IFPI) in capital letter or the logo of IFPI shall be recorded.

In the second part of this area the mould identification shall be recorded as a 4-character alpha-numeric identifier.

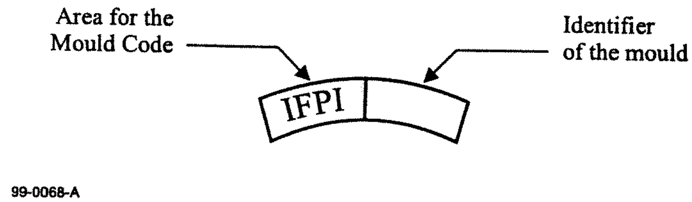

Figure J.2 - Mould Code allocation

J.5.4 Relaxation of requirements

The Mould Code shall be recorded on all substrates, whether or not containing valid contents, including blank disks. Overprinting the Mould Code for decorative purpose is allowed.

J.5.5 Remaining of the sector area

The remaining of the sector not used for the SID Code can be used for characters required by local legislation or by user-defined characters.

Annex K
(informative)

Measurement of the thickness of the spacer of Dual Layer disks

This annex indicates two convenient methods for measuring the thickness of the spacer which is the layer of transparent material between Layer 0 and Layer 1 of Dual Layer disks.

K.1 Laser focusing method

Laser is focused sequentially on each recorded layer by means of an objective lens. The distance by which the lens must be moved equals the thickness of the spacer. As an example, figure K.1 shows schematically an implementation of a Type C disk.

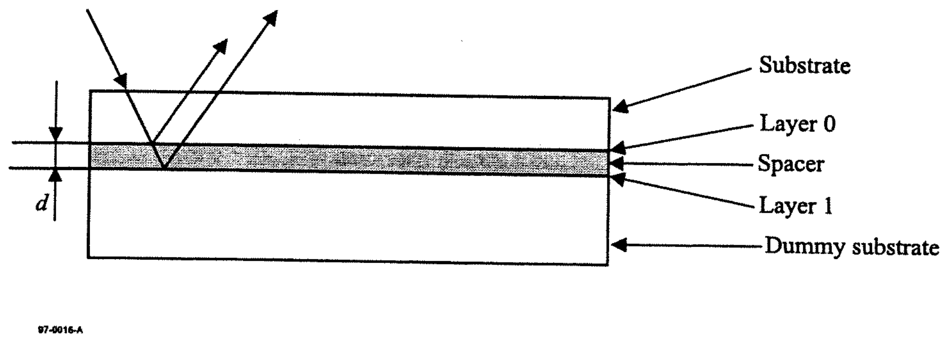

Figure K.1 - Measurement of the thickness of the spacer

K.2 Interferometer method

Light with varying wavelength is used with a Dual Layer disk (figure K.2). The thickness d of the spacer of known index of refraction n is determined by measuring the phase difference between the reflected light from Layer 0 and from Layer 1.

The thickness is obtained from the relation

$$d = \frac{\lambda_1 \times \lambda_2}{2n(\lambda_2 - \lambda_1)}$$

where n is the index of refraction of the spacer.

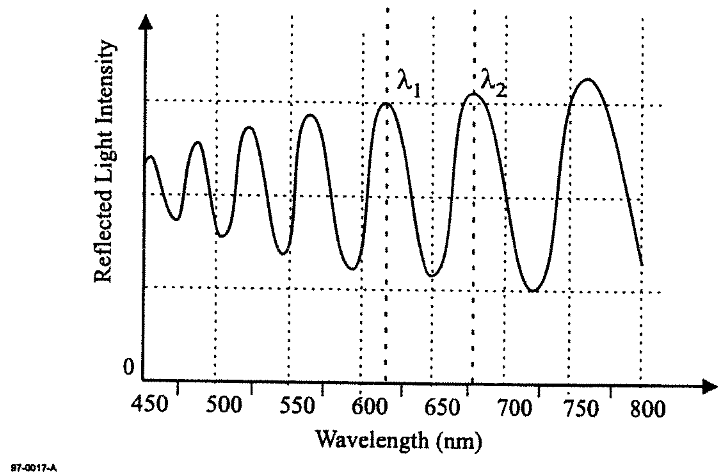

Figure K.2 - Reflected light intensity

Annex L
(informative)

Note on the Reference Code

The purpose of the Reference Code is to provide Channel bit patterns that generates (3T-6T-7T) separating signals. A drive may use these signals to adjust the equalizer for reading HF signals. This annex describes a practical method for generating the required Channel bit patterns.

As described in Section 4, Main Data is scrambled before generating ECC bytes. In order to get, after scrambling and ECC bytes generation but just before modulation, a specific data pattern that will generate 3T, 6T and 7T modulated channel signals, pre-scrambling is applied to the Main Data. If the pre-scrambling data is the same as the normal scrambling data used by the encoding process described in this ECMA Standard, then the same scrambling data is added twice to the user data and non-scrambled data appears just before generating the ECC bytes. This means that the Recording Frames contain fixed data patterns which are duplicates of the Main Data, except for the ECC bytes. The pre-scrambling data is added to all 32 Data Frames used in the Reference Code Zone, except to the first 160 Main Data bytes of the first Data Frame in each ECC Block, so as to avoid large DSV values.

The following steps show how to process the Main Data intended for the Reference Code before it is fed into the encoding system.

Step 1

Set all Main Data bytes of the 32 Data Frames to (AC).

Step2

This step is applied to the Data Frames intended for Physical Sectors with Sector Numbers 192 512, (02F000) to 192 543, (02F01F).

To Physical Sectors with Sector Numbers from 192 512 (02F000) to 192 527 (02F00F) add the pre-scrambling data, generated using the scrambling procedure of clause 17 with the initial pre-set number (0) to all Main Data bytes, except the first 160 of the Physical Sector with Sector Number 192 512, (02F000).

To Physical Sectors with Sector Numbers from 192 528, (02F010) to 192 543, (02F01F) add the pre-scrambling data, generated using the scrambling procedure of clause 17 with the initial pre-set number (1), to all Main Data bytes, except the first 160 such bytes of the Physical Sector with Sector Number 192 528, (02F010).

Annex M
(informative)

Maximum transfer rate

The maximum transfer rate is the rate at which the recorded content of a disk has to be transferred in order to sustain the application. The possible values of this transfer rate are specified by Byte 1 in 26.5.1. This information may be useful for the drive for controlling the rotational speed of the disk.

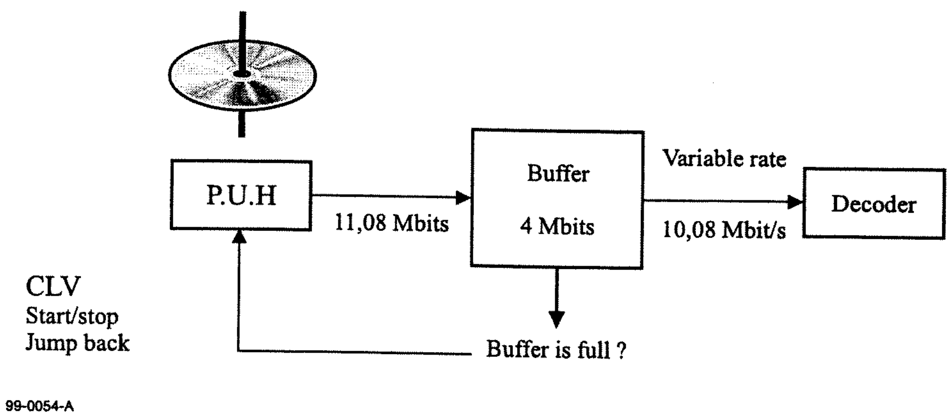

Figure M.1 - Example of a DVD video player

The DVD video drive shown in figure M.1 has a buffer of 4 Mbits. For video applications the maximum transfer rate is 10,08 Mbit/s, it is the rate at which the content of the buffer has to be transferred to the decoder. If the minimum transfer rate from the disk to the buffer - i.e. the input rate into the buffer - is higher than the specified maximum transfer rate - i.e. the output rate from the buffer - then, after some time, the buffer is filled. The pick-up head stops reading, using jump back mode, until the data content of the buffer is decreased. Thus the video player can be seen as a kind of asynchronous system.

In order to ensure a seamless reproduction, the bit rate of the data input to the buffer should be larger by 1 Mbit/s than the bit rate out of the buffer. Usually a DVD video disk is rotated in CLV mode and the read-out rate of the player is 11,08 Mbit/s. If the drive knows the information about the maximum transfer rate, it can determine the appropriate minimum read-out rate and the minimum rotational speed.

For applications that do not require a high transfer rate, a drive may rotate the disk in slow rotation mode and, thus, reduce its power consumption. This slow rotation mode is particularly convenient for battery-operated drives. This is the main reason why three different maximum transfer rates are specified in Byte 1 of 26.5.1.

Annex N
(informative)

Disk bonding

N.1 Disk bonding at the centre hole of the disk

In the area of the centre hole, the disks may exhibit an empty gap between the two substrates. Thus, it is possible that the clamping finger of some clamp mechanisms, for instance of a notebook drive, extends into this gap, so that a deformation or even a damage of the disk occurs. There is also a possibility that these gaps could be the cause of axial errors in case that dust or humidity has entered the space between the two substrates.

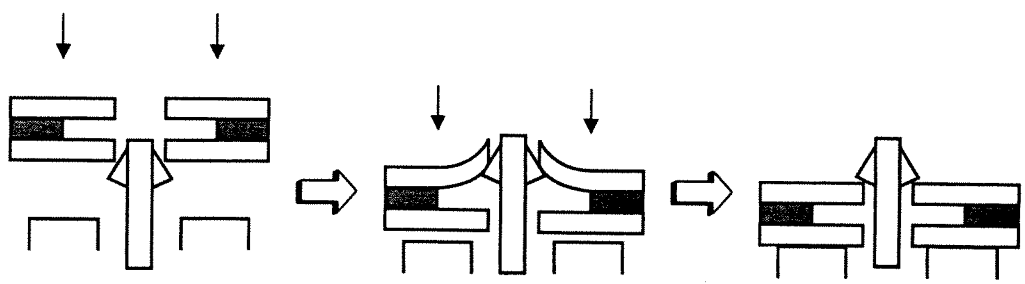

Figure N.1 - Action of the clamping finger

It is recommended that the area from the inner diameter of the Clamping Zone to the outer diameter of the Lead-out Zone (or Middle Zone) be glued. It is also recommended that the gap between the two substrates be as narrow as possible in order to prevent the clamping finger to extend into it. Furthermore, it is recommended that the specification of the clamping force and/or the taper angle of the clamping device be such as to avoid definitive damage of the disk. These considerations should be kept in mind when implementing clause 7 where it reads : "The centring of the disk is performed on the edge of the centre hole of the assembled disk on the side currently read. Clamping is performed in the Clamping Zone."

N.2 Disk bonding at the outer edge of the disk

There are many disks on the market where the glue protrudes from the outer edge of the disk. In one case, the protruded glue may be not or partially cured (figure N.2). In another case, the protruded glue sticks out from the outer edge of the disk onto the laser entry surface like a burr (figure N.3). When a tray loader is used, it is possible that the clamping will fail because the disk outer edge is sticking to the tray (figure N.4). When a slot-in type loader is used, it is possible that the disk is also not loaded normally because the uncured glue is sticking to the guide shaft or drive roller (figure N.5). When the disk with burr is loaded, the loader may get scratched.

Thus, it is recommended for a disk that the glue protruded from the disk outer edge is fully cured and there is no protruded burr that exceeds the laser entry surface.

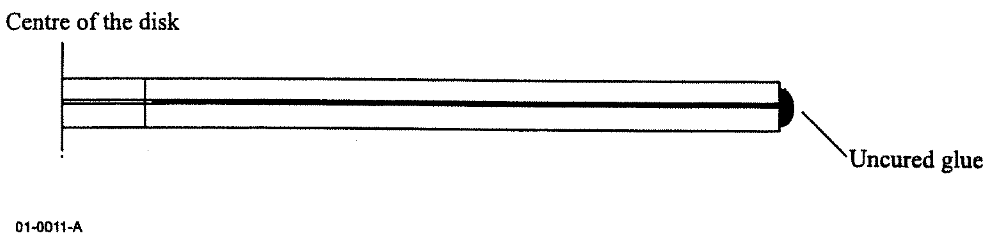

Figure N.2 - Uncured glue

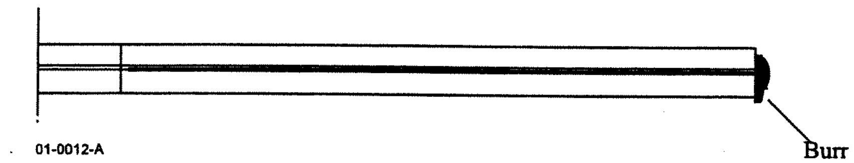

Figure N.3 - Burr

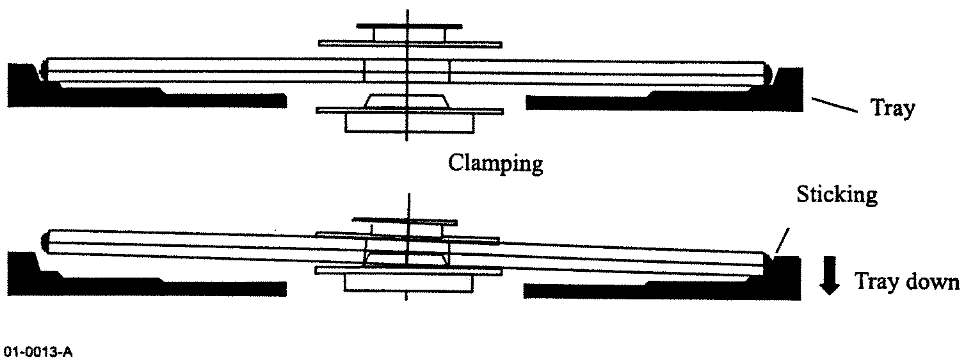

Figure N.4 - Tray-loader mechanism

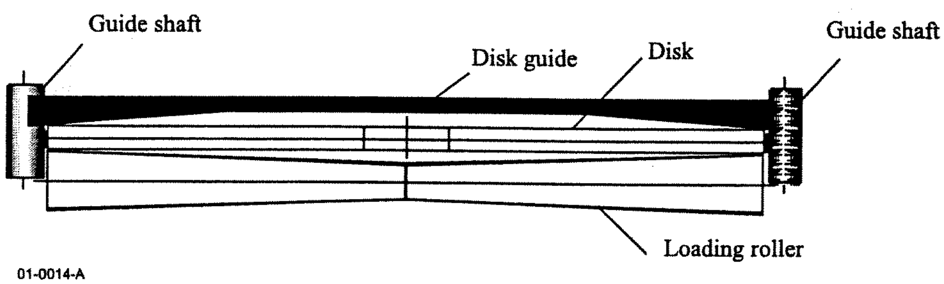

Figure N.5 - Slot-in mechanism

Annex P
(informative)

Transportation

P.1 General

As transportation occurs under a wide range of temperature and humidity variations, for differing periods, by many methods of transport and in all parts of the world, it is not possible to specify mandatory conditions for transportation or for packaging.

P.2 Packaging

The form of packaging should be agreed between sender and recipient or, in absence of such an agreement, is the responsibility of the sender. It should take into account the following hazards.

P.2.1 Temperature and humidity

Insulation and wrapping should be designed to maintain the conditions for storage over the estimated period of transportation.

P.2.2 Impact loads and vibrations

a) Avoid mechanical loads that would distort the shape of the disk.

b) Avoid dropping the disk.

c) Disks should be packed in a rigid box containing adequate shock-absorbent material.

d) The final box should have a clean interior and a construction that provides sealing to prevent the ingress of dirt and moisture.

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EXHIBIT C

BASIS FOR CALCULATING COMPRESSION AND AUTHORING CHRAGES

Basis for calculation of C&A budgets

sonopress
arvato

April 2005

EURO €		< 5	90	100	120	150
Video Level 1 (incl. Stereo)	*per min*	40	15	14,5	14,5	14,5
Level 2 (incl. Stereo)	*per min*	50	18	17,5	17,5	17
Level 3 (incl. 5.1)	*per min*	60	26	25	25	24,5
QC	*per min*		2,2	2,2	2,1	2
Audio 5.1	*per min*		8	8	7,5	7,5
Stereo/Mono	*per min*		5,5	5,2	5,2	5,2
Polish audio without QC	*flat*	350				
Polish audio already encoded	*flat*	150				
Audio Stream Verification	*flat*	250				
QC	*per min*		2,5	2,2	2,2	2,2
Authoring	*per hour*	145				
Subtitling feature	*per stream*	50				
Subtitling featurettes	*per language*	75				
DLT	*per tape*	80				
DVD-R	*per disc*	40				
VHS	*per tape*	35				
Producer	*per hour*	125				
Chaptering	*per feature*	80				
Menu/Graphics	*per project*	*on request*				
B/C Titles from US PSD		580				
B/C Titles from US DVD		650				
B/C Titles new Design		1200				
Check Disc QC setup	*per disc*	300				
Feature	*per min*	2,2				
VAM	*per min*	2,2				
Navigation	*per language*	45				
Language Track	*per stream*	45				
Audio editing (conforming)	*per track*	435				
Subtitle creation	*per min*	11				
Cloning						
DA88 for Poland	*per feature*	90				
Screeners	*per screener*	1.200				
additional languages	*per language*	80				
Shipping Costs	*per package*	30				
Benelux non-Trailer Version	*per titles*	475				